Obesity hypoth dr4.Aug 5 2002.doc August 5, 2002
Proposed Core Hypothesis/Question Justification

Social Environmental Influences on Child and Adolescent Obesity

I. Social environmental influences on obesity

Economic, cultural, social, and policy characteristics of the social environment, along with characteristics of the physical environment, influence the development of obesity from conception to adulthood. These factors operate largely through influences on family and social network resources and processes that affect behaviors related to energy balance (diet, activity, and inactivity).

II. Workgroup: *Social Environment*

III. Contact persons for proposed core hypothesis/question

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IV. Public health significance

The recent Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity (USDHHS, 2001) identifies obesity as a serious threat to health. Obesity accounts for about 300,000 deaths a year. Obese individuals (those with body mass index (BMI) greater to or equal to 30) have a 50 to 100 percent increased risk of premature death compared to non-obese individuals (BMI=20-25). Morbidity from obesity may be as great as from smoking and problem drinking. Obesity is associated with increased risk for coronary heart disease, type 2 diabetes, endometrial, colon, postmenopausal breast and other cancers, and certain musculoskeletal disorders. Childhood obesity is the strongest predictor of type 2 diabetes and has a substantive impact on the precursors of chronic disease in adults (Khan and Bowman, 1999).

The prevalence of obesity has been rising. The percent obese among adults 20-74 rose from 15% in the late 1970's to 27% in 1999. During this time period, the percent overweight rose from 7 to 13% among children 6-11 years of age, and from 5 to 14 percent among children 12-19 (USDHHS, 2001). While cost estimates are very difficult to calculate, the health care related additional costs of obesity for children ages 6 to 17 are around $127 million (2001 dollars) (Wang and Dietz 2002). Medical costs for the entire US population were estimated in 1995 to be $51.6 (Wolf and Colditz 1998) to $62.3 billion(Frazao 1999), or $59.96 to 72.4 billion in 2001 dollars. The total cost including lost productivity in 1995 was $99.2 billion ($115 in 2001 dollars) (Wolf and Colditz, 1998), and is now over $117 billion (USDHHS, 2001).

The relevance of the social environment to obesity is clearly evident in two well-documented findings. The first is that obesity varies with socioeconomic status and racial or ethnic identity. Income is inversely related to overweight among white adolescents in the United States, but directly related to income among Mexican American and black adolescents (USDHHS,1998).

Data from the NHLBI Growth and Health Study on 9 and 10-year old girls show a similar pattern for white girls but no significant association between family income or education and obesity for African American girls. (Crawford et al., 1999).

The second finding is that obesity has been increasing in countries around the world in response to economic and social changes spurred by economic development and globalization (Khan and Bowman, 1999). These trends have been documented in adults (Popkin, 2002) as well as children (de Onis and Blössner, 2000). In very poor countries, obesity is rare and tends to be positively associated with income; in wealthy countries, obesity is more common but more likely to affect the poor (Khan and Bowman 1999).

The relevance of the social environment is also evident from the fact that the recent increase in childhood obesity cannot be explained by changes in the genetic background or energy metabolism of the population. Simply put, social environmental influences, acting either by themselves or in interaction with biological mechanisms, must necessarily be involved in rapidly-occurring changes in prevalence such as those recently observed in obesity and overweight.

The specific social environmental influences and mechanisms responsible for producing these changes have been the subject of much speculation and preliminary research, but existing studies provide few definitive or simple answers. The National Children's Study provides an outstanding opportunity to extend and refine our understanding of these complex influences and to identify potentially modifiable pathways in the etiology of childhood overweight and obesity.

V. Justification for a large prospective, longitudinal study

A. Multiple aspects of the social environment influence obesity etiology and management. Although obesity itself is common, elucidating the complex pathways that contribute to obesity will require a large sample because interactions will be common. For example, we anticipate interactions between racial and ethnic identity and the influence of peers on weight and weight control behavior. Social policy variables will have their greatest impact in poor families.
B. A large prospective study is needed to adequately represent a range of geographic, environmental, economic, cultural, and policy variability among neighborhoods and communities, to select enough cases within neighborhoods and communities to permit estimation of neighborhood effects, and to model social environmental influences.
C. Residential mobility is a critical problem in studies of neighborhoods and neighborhood effects. A prospective longitudinal study will be able to follow respondents over time and monitor residential mobility in order to assess residential change or mobility and the role it plays in determining access to healthy or unhealthy food and activity environments.
D. Collection of retrospective data on variables such as family stress, parenting, and cultural beliefs is not possible. These factors must be observed prospectively.

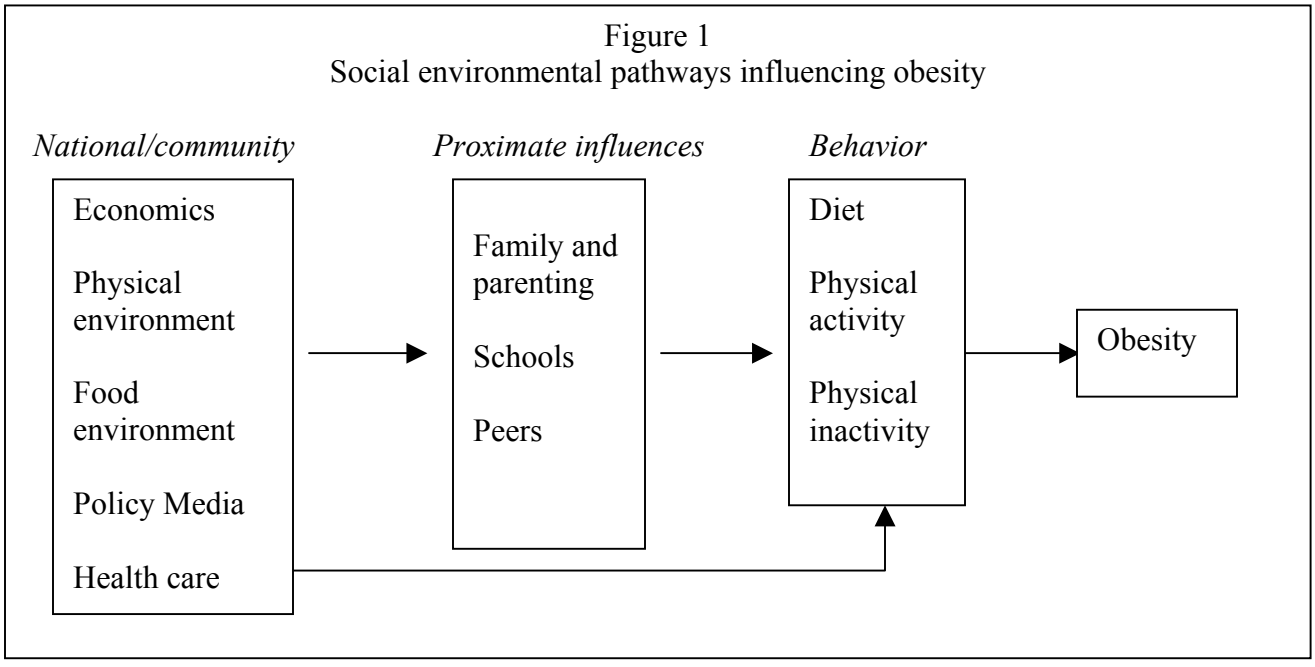
VI. Scientific Merit

P*roximate pathways*

If the social environment is to have an influence on obesity, it must do so through more proximate processes that affect energy balance. Energy balance is a function of energy intake (a function of the quantity and nutritional content of foods consumed) and energy expenditure (a function of resting energy expenditure, the thermic effect of food, and physical activity and inactivity Goran, 2001). Behaviors such as diet and physical activity and inactivity are key pathways for social environmental influences on energy balance, overweight, and obesity (Obarzanek et al., 1994). Nonbehavioral pathways may also mediate the social environment's influence on energy balance: social environmental cues have been shown to influence physiological functioning in children and adults (Repetti et al., 2002) and some evidence links stress-related processes to adiposity (Epel et al., 2000). This hypothesis focuses primarily on behavioral pathways.

The World Health Organization's International Obesity Task Force has summarized processes that affect energy balance and obesity at the international, national, community, work, school, and family levels in a model commonly referred to as the "causal web" of societal influences on obesity prevalence (Kumanika, 2001). Figure 1 provides a modified version of this model that focuses on the pre-adult years, emphasizes the role of the family, and directs attention to the behavioral pathways that intervene between environmental influences and energy balance.

Figure 1
Social environmental pathways influencing obesity



Environmental influences on obesity over the course of development

The hypothesis put forward by the Early Outcomes of Adult Health Working Group identifies four critical periods for the development of obesity: pre-pregnancy and fetal life, infancy, early childhood, and childhood and adolescence. Behavioral pathways for social environmental influence will vary across these periods and will interact with key milestones in physical development (e.g., adiposity rebound, puberty).

Figure 2 summarizes the key mediating pathways, and the family/school and broader environmental influences hypothesized to be important during prenatal life, infancy, childhood, and adolescence.

Figure 2
Mediating pathways and environmental influences by developmental stage

Developmental stage	Prior to birth	Infancy	Early Childhood	Childhood and Adolescence
Key Pathways	Accelerated fetal growth	Infant feeding practices	Energy balance	Energy balance
Proximate influences	SES Maternal nutrition Prenatal care Pregnancy planning	Education Work status Family support	Family resources Education Parenting (feeding practices, monitoring activity)	Same as early childhood, plus: School food environment, physical education Peer groups
National/ community influences	Social support Health care access Safety-net programs	Social support Health care	Food environment Physical environment (transit, recreation) Social norms Media Policy	Same as early childhood

Prenatal life: Programs that connect low-income women to early prenatal care and social environmental influences that support the management of maternal hyperglycemia during pregnancy reduce the risk of accelerated fetal growth and the child's subsequent risk of childhood obesity.

The effects of prenatal development on subsequent obesity risk are clearest with respect to accelerated fetal growth (macrosomia), which is associated with an increased risk for obesity. Macrosomia is most often related to maternal hyperglycemia or diabetes, a condition most prevalent in older, Asian and American Indian, and immigrant mothers (Martin et al., 2002, Kieffer, et al., 1999). Pre-conception care, early access to prenatal care and careful management of pregnancy weight gain and nutrition play an essential role in reducing the risk of macrosomia.

Previous research has documented the importance of social environmental factors in influencing pregnancy-related health care and health behavior, but virtually no research has examined these issues in the context of obesity risk. Early prenatal care and pre-conception counseling are both more likely to occur among women who have planned their pregnancies (Kost, et al., 1998; Holing, 1998), which in turn is more likely among non-minority women, married women and women of higher socioeconomic status (Henshaw, 1998). Adequate prenatal care has been linked (inversely) to maternal stress during pregnancy (Sable and Wilkinson) and (directly) to employment and social and emotional support (Oropesa et al., 2000). Among women with established diabetes, seeking preconception counseling was associated with employment, being married and living with a partner, and higher socioeconomic status (Janz et al., 1995).

Adherence to healthy behaviors in pregnancy is associated with maternal education (Kost, 1998), and, among Mexican-Americans, more likely among immigrants than native-born women (Zambrana et al., 1997). Social support and low levels of maternal stress during pregnancy are also likely to facilitate adherence to healthy behaviors and management of weight gain and nutrition.

The role of "safety net" programs, including Medicaid, WIC, and income maintenance programs is unclear. Although such programs have been found to reduce the incidence of low-birthweight (Currie and Gruber, 1996; Currie and Cole, 1993; Kehrer and Wolin, 1979; Metcoff et al, 1985), a relationship to other birth outcomes and prenatal care has not been demonstrated (Kaestner, 1999). However, research suggests that smoking rates among pregnant women are responsive to cigarette tax rates (Ringel and Evans, 2001), suggesting that policy variables may have an impact on pregnancy health and behaviors.

Infancy: Support for breastfeeding in the work environment and kin/nonkin networks of new mothers will contribute to lower rates of obesity through increasing the probability of breastfeeding and the duration of breastfeeding. These factors partially mediate the influence of socioeconomic status on breastfeeding and obesity.

Both breastfeeding and longer duration of breastfeeding are related to lower risk of being overweight during older childhood and adolescence (Gillman et al 2001). In the United States and most other developed countries, breastfeeding is more common among higher SES families. However, breastfeeding practices are also influenced by a large number of broader social and cultural factors, including the attitudes, beliefs, and experiences of the new mother's friends and family members, cultural values about mothering, and norms regarding breastfeeding in public spaces and workplaces (Pain 2001). They also include workplace policies including duration of maternal leave and breastfeeding conditions at work (Yilmaz 2002). Links between SES and lack of support for breastfeeding may reflect, on the one hand, the greater knowledge and/or concern about the health benefits of breastfeeding among more educated women, the generally less favorable attitudes towards breastfeeding in low-income populations, and potential differences in support offered by medical providers. On the other hand these links may reflect the lower status jobs held by poorly educated women, which generally entail fewer maternity benefits and possibly less tolerant attitudes to combining breastfeeding with paid work.

Early Childhood: Parenting behaviors influence the timing of adiposity rebound and changes in adiposity during childhood through their effects on children's diet and physical activity/inactivity. Parenting behaviors are a function of the family's food and physical environments, family resources (structure, parental education and income), and norms and beliefs supported through kin and nonkin networks.

Throughout childhood and adolescence, dietary predictors of gain in adiposity include greater energy intake and a higher percentage of energy from fat (Davison and Birch, 2001). Physical activity and inactivity comprise the behavioral components of energy expenditure. Important components of activity in childhood and adolescence include formal and informal participation in sports, games, and exercise, and patterns of transportation (walking vs. driving). TV watching is the most commonly studied type of inactivity, although video game and computer use have also been examined. Physical activity in children has been shown to reduce obesity risk in observational studies (Bild et al 1996); both observational and experimental research support an inverse relationships between TV viewing and weight gain (Stettler, 2002).

The family is a critical context for the development of obesity. Throughout most of childhood and adolescence, parents have the primary responsibility for shaping the child's diet. Laboratory studies show that children's food preferences, food selection, and regulation of energy intake are affected by parental feeding practices, including the foods made available to them, portion sizes, and parental efforts to direct children's eating. In many cases parenting practices (e.g., parental overcontrol of children's food intake or modeling of disinhibited eating) undermine children's development of self-regulation (Birch and Davison, 2001). Families also influence physical activity and inactivity patterns by actively engaging their children in activity (family outings, enrolling children in sports), by modeling (TV watching, walking rather than driving), and by monitoring and control of sedentary activities.

In managing their children's diets and physical activity, parents are constrained by the environments they occupy, the resources they control, and the influence of cultural norms and beliefs. Recent research has given increasing recognition to the physical or built environment in studies of physical activity. Many observational studies have documented strong associations between physical activity in adults and such features of the physical environment as the accessibility of recreational facilities, the nature of public transportation systems, and the presence of hills and walking paths. However, the evidence from experimental studies supporting a causal effect is weak (Brownson et al., 2001). There is a need for more complex models that account for the social and economic factors that affect residential location, and that incorporate elements of the social environment (such as norms and time constraints) that may influence physical activity.

Food environments have changed significantly over recent decades for most American families. The availability of foods prepared away from home has increased from around 26 percent of the household food budget in 1960 to nearly 50 percent in 1995 (Putnam and Allshouse,1996), and the number of fast-food and other restaurants has mushroomed. Prepared foods and foods served in restaurants tend to be higher in energy content, portion size, and fat content than foods prepared in the home (Away from home represented 27% of all meals and snacks, but 34% of total calories, according to analysis using the USDA's Continuing Survey of Food Intake of

Individuals (Lin, Frazao, and Guthrie 1999)). They are also heavily promoted in the mass media, particularly in television advertising. . The change in women's labor force participation is one of the single most important factors in explaining the changes in eating out and use of convenience foods (Kinsey 1983) While providing added convenience to families, changes in the food environment have resulted in increased consumption of certain energy-dense foods, such as soft drinks, cheese (pizza), and foods with added fats and sugars (French et al, 2001).

Little research has investigated the characteristics of local food environments. A recent study linked availability of supermarkets to diet-related disease in an urban setting (Farmers Market Trust, no date), while another documented the greater availability of supermarkets in higher-income areas (Morland et al., 2002).

The economic, policy, and social characteristics of the broader environment are likely to influence both food and activity environments. For example, neighborhoods characterized by high levels of crime are likely to constrain opportunities for outdoor physical exercise. Communities high in social capital may be better able to acquire common resources, such as playgrounds and other facilities, that promote an active lifestyle. Areas that are economically depressed are unlikely to attract supermarkets or the competitive pressures that improve the quality of foods offered by markets. As noted above, programs such as WIC, Food Stamps, and Temporary Assistance for Needy Families (TANF) are designed to provide a safety net for poor families and children so that nutritional and other basic needs can be met. The Food Stamp Program provides only limited nutrition education programs, so other aspects of the social environment still have a wide impact on the family's ability to provide maintain a healthy weight for all members.

Family resources, including family structure, education and income, influence parental management of children's energy balance. Parental education is inversely associated with adolescent obesity in males of every ethnic group, as well as among black adolescent girls (Troiano, 1998). Knowledge of nutrition and use of nutrition labeling by parents is associated with lower overweight in children (Variyam, 2001) and well educated parents may have more awareness of and concern for meeting recommended dietary standards. More affluent parents are better able to afford homes in communities that provide access to recreational facilities and safe environments for outdoor exercise. Stresses associated with poverty have also been shown to influence parenting practices and increase the prevalence of neglectful or abusive parenting (Repetti et al., 2002). In a Danish study, children of nonsupportive parents and neglected children were found to be at greater risk of obesity in early adulthood (Lissau and Sorensen, 1994). Time pressures and poverty associated with single parenthood may plausibly influence parental management of energy balance independent of maternal education. One US study showed an increased risk for obesity in white, but not black girls of single-parent family (Kimm , 1996), while another study in New York State showed an opposite result (Wolfe, 1994).

Finally, parental management of children's diet and activity are likely to be influenced by shared values and norms within the parents' kin and nonkin networks, as well as the impact of external influences (media, exposure to new ideas through "weak" ties such as contacts with co-workers and health care workers). Norms regarding parenting, including how parents should feed their children, how much they should let them watch TV, and whether they should enroll them in

organized sports, are constructed out of social experience and interaction. These norms are internalized as cognitive representations ("schema') of parenting, developed on the basis of experience and influenced by the exchange of ideas about how to raise children "well" among friends and family members. Local social networks play an important role in vetting new ideas introduced by external sources. Socioeconomic status and racial/ethnic identification is likely to influence the mix of external and social network resources that shape parenting within each family.

Late childhood and adolescence: The influence on obesity of non-family factors, including peer and media norms for thinness or body shape, access to and promotion of energy-dense foods, and opportunities for physical activity in schools and communities, increases with increasing age and intensifies after puberty. Social interaction with peers influences physical activity/inactivity and diet, and is in turn adversely influenced by obesity in children and adolescents. Sociocultural influences on diet and physical activity differ by race, ethnicity, and gender.

As the child's experience moves beyond the family into school and peer environments, these new settings assume greater influence over diet and activity patterns. However the family's influence remains important as long as the child remains a member of the family household, and (as suggested by research on parental influence on adolescent risk behavior) this sustained influence may be greater in families where warm and authoritative parenting sustains close parent-child relationships.

Features of schools believed related to childhood and adolescent obesity risk include: (1) the nutritional content of foods made available in schools, including both cafeterias and vending machines offering sodas and snacks; and (2) the availability (and requirements for) regular physical education classes and involvement in organized sports. Other aspects include patterns of transportation to and from school (French et al., 2001; Dietz and Gortmacher, 2001; Edmundson et al., 1996). Relevant community features include those relevant to families during childhood: access to parks and recreational facilities, the transit characteristics of neighborhoods, and accessibility of fast-food restaurants and other sources of energy-dense foods.

Peer relationships become more important during late childhood and early adolescence, and the norms shared by peer networks regarding food preferences, activity patterns, and ideal body types (e.g. shape, thinness) exert an increasing influence during this period. During the ages 8-14, weight concerns and dieting behaviors are influenced by friends' dieting (Packard and Krogstrand, 2002). Changes associated with puberty – weight gain often associated with lower self esteem and depression (Ge et al., 2001) - complicate peer relationships and may intensify the influence of peer norms.

Evidence suggests that media influences may have a substantial impact on body type ideals and diet behaviors (Becker, et al., 2002; Bilukha and Utermohlen, 2002; Jones, 2001) and that media advertising is specifically designed to target the food choices of children and adolescents (Kraak and Pelletier, 1998). Social networks provide the context in which media images of desirable body types are evaluated and personalized. These processes remain poorly understood.

There is some evidence that cultural values for thinness vary across racial and ethnic groups (Kumanika et al., 1993), although evidence on this is inconsistent (Cachelin et al, 2002). However, overweight does appear to have fewer consequences for depression and low self-esteem in African American and possibly Hispanic populations than in white populations (Ge et al, 2001; Sorbara and Geliebter, 2002; Bay-Cheng et al., 2002). Gender also has a powerful influence on concerns about body shape and thinness (Cachelin et al., 2002). (explain, males and female differences)

Reciprocal influences of overweight and obesity on behavior are incompletely understood and have not been well integrated into lifecourse models of obesity. A study of British youth suggests that by age 9, children have very negative images of overweight individuals (Hill and Silver 1995). Children who are obese at ages 9-10 have lower levels of self-esteem by ages 13-14 (Strauss, 2000) and puberty-associated increased in weight also result in depression and increased somatic complaints (Ge et al., 2001). If overweight children are less likely to have positive peer relationships and are less able to engage in games and sports, self-reinforcing feedback mechanisms are set in place that will magnify biological predispositions and initial trajectories via social mechanisms. These mechanisms have not been adequately studied.

VII. Potential for innovative research

Research that links the characteristics and dynamics of the social environment to biological pathways resulting in the development of obesity is in its infancy. A study of the scope of the NSC is necessary to adequately model the contributions of various social environmental domains and factors to the behavioral, psychological, and biological processes that lead to obesity and complicate its management. Opportunities for innovation include:

- Development of research regarding the environmental determinants of stress-induced changes in physiological functioning and their links to the development of obesity. Integration of epidemiological and social science perspectives will greatly enrich the potential of stress research and could point the way to innovative interventions.
- The opportunity to examine how variations in family food environments intersect with family norms, resources, and functioning to affect the development of overweight and obesity in children and adolescents. Research on family functioning, parenting, and obesity risk has been extremely limited to date.
- The opportunity to examine, in a national setting, the impact of public policies, health programs, and school environments on obesity risk.
- Research on the effects of various media diets on physical activity and diet.
- Research on the mutual influence, over time, of children's risk factors for obesity, parenting processes that manage weight, and children's social development, family relationships, and involvement with peers, in the development or avoidance of obesity.

VIII. Feasibility

A. Sampling needs

1. The study sample must include areal units (e.g., an urban neighborhood or rural community) that are broadly representative of the United States and diverse with respect to race/ethnic composition, socioeconomic status, rural/suburban/urban location, region, proximity to health services, public policy environment, and food/physical activity environments.
2. In selected communities, in-depth studies are recommended to provide richer data on the social dynamics of parenting, cultural values affecting parenting, diet, weight management, and physical activity, and the impact of the physical and media environment.
3. Families (the focal child plus primary caretaker) must be tracked to new destinations and the circumstances prompting moves documented.
4. Sample size – adequate samples within areal units are required for multi-level modeling of community effects.

B. Contact/Assessment

Assessments of most or all of the measures below are desirable during pregnancy, early infancy, and every two to three years during childhood and adolescence.

C. Nature of measurement

Measurement of physiological pathways underlying the etiology of obesity is left to the Early Antecedents of Adult Health working group. Other needed measures include the following. Except where noted, data to be collected through interview.

Community/neighborhood level (available through administrative or other existing records or obtained through direct observation):

- Area poverty, crime, economic opportunities
- Policy environment – eligibility and provisions for WIC, Medicaid, TANF
- Physical environmental characteristics – access to public transit, parks, recreational facilities, safety of walkways
- Food environment characteristics – accessibility of grocery stores selling fruits and vegetables, fast food and other restaurants
- Access to health care

School characteristics:

- Access to vending machines and contractual arrangements with soft drink vendors
- Foods offered in school cafeteria
- Physical education: availability and requirements
- Opportunities for extra-curricular sports and exercise
- Location of school in relation to student population and provisions for transportation

Family/household characteristics:

- Income, parental education, family structure, employment, homeownership, language
- Family enrollment in welfare, social service programs, health insurance (possible collection via administrative records?)

- Residence history and reasons for moves
- Family meal environments – meals eaten at home, prepared at home, eaten away from home; meal style (passed at the table, portioned out in kitchen, eaten together, seconds encouraged or discouraged), foods offered and parenting practices directed at children's eating. Breastfeeding – duration and supplementation, reasons for or against breastfeeding
- Child feeding questionnaire (Birch, et al., 2001)
- Parenting practices related to physical activity: control of TV watching, video and computer usage, walking vs driving, modeling/encouragement of exercise.
- Maternal stress (use available scales)
- Mother's social networks and social support (available scales); content of network interactions relevant to parenting, breastfeeding, diet, weight concerns, pregnancy, positive and negative interactions
- Energy balance of parents: Diet, physical activity and inactivity (food diaries, time use data)
- Media use

Work environment:
- maternity leave policies
- breastfeeding supports

Children's social ties:
- Position of child in peer network and network density
- Values and behaviors of network members regarding diet, body image, physical activity, dieting behaviors

Individual Level:
- Child's relationship to parents
- Child's racial and ethnic identification, gender
- Child's time use, media use, energy balance (same measures as for parents)
- Child's BMI and/or other measures of weight status (e.g., caliper tests)
- Child's birth order

D. Burden on participant and family

Much of the information needed above is also required for studies of other outcomes.

E. Ethical consideration if any

1. None unique to obesity etiology and management; general issues include need to protect privacy of individuals and communities, when to intervene in families to protect children's health.

IX. References

Bay-Cheng LY, Zucker AN, Stewart AJ, Pomerleau CS. Linking femininity, weight concern, and mental health among Latina, Black, and White women. *Psychology of Women Quarterly*. 2002; 26:36-45.

Becker AE, Burwell RA, Gilman SE, Herzog DB, Hamburg P. Eating behavioursbehaviors and attitudes following prolonged exposure to television among ethnic Fijian adolescent girls. *British Journal of Psychiatry*. 2002; 180:509-514.

Bild DE Jacobs DR Sydney S Haskell WL Anderssen N Oberman A. Physical activity in young black and white women. The CARDIA Study. *Annals of Epidemiology.* 1993; 3(6): 636-644.

Bilukha OO, Utermohlen V. Internalization of western standards of appearance, body dissatisfaction and dieting in urban educated Ukrainian females. *European Eating Disorders Review.* 2002; 10: 120-137.

Birch LL, Davison KK. Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatric Clinics of North America*. 2001; 48: 893-907.

Birch LL, Fisher JO, Grimm-Thomas K, Markey CN, Sawyer R, Johnson SL. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite* 2001;36 (3): 201-210.

Brownson RC, Baker EA, Housemann RA, Brennen LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *AHPH.* 2001; 91:1995-2003.

Cachelin FM, Rebeck RM, Chung GH, Pelayo E. Does ethnicity influence body-size preference? A comparison of body image and body size. *Obesity Research*. 2002; 10:158-166.

Crawford PB, Drury A, Stern S. Childhood obesity and family SES racial differences. *Healthy Weight Journal*. 1999; May/June: 42-43.

Currie J, Cole N. Welfare and child health: The link between AFDC participation and birth weight. *American Economic Review.* 1993; 83: 971-985.

Currie J, Gruber J. Saving babies: The efficacy and cost of recent changes in the Medicaid eligibility of pregnant women. *Journal of Political Economy.* 1996; 104:1263-1296.

Davison KK, Birch LL. Child and parent characteristics as predictors of change in girls' body mass index. *International Journal of Obesity.* 2001; 25: 1835-42.

de Onis M, Blössner M. Prevalence and trends of overweight among preschool children in developing countries. *Am J Clin Nutr* 2000;**72**:1032-9.

Dietz WH, Gortmaker SL. Preventing obesity in children and adolescents. *Annu Rev Public Health*. 2001; 22:337-53.

Edmundson E, Parcel GS, Feldman H, Elder J, Perry CL, Johnson CC, Williston BJ, StoneEJ, Yang M, Lytle L, Webber L. The effects of the Child Adolescent Trial for Cardiovascular Health upon psychosocial determinants of diet and physical activity behavior. *Preventive Medicine.* 1996; 25(4): 442-454.

Epel ES, McEwen B, Seeman T, Matthews K, Castellazzo G, Brownell KD, Bell J, Ickovics JR. Stress and body shape: Stress-induced cortisol secretion is consistently greater among women with central fat. *Psychosomatic Medicine*. 2000; 62:623-632.

Farmers' Market Trust. Food for every child: The need for more supermarkets in Philadelphia. Philadelphia, PA; Farmers' Market Trust. No date.

Frazao E. High costs of poor eating patterns in the United States. *America's Eating Habits: Changes and Consequences.* E.Frazao, ed., 5-32. Washington, DC: USDA/ERS, 1999.

French SA, Story M, Jeffery RW. Environmental influences on eating and physical activity. *Annu. Rev. Public Health.* 2001; 22: 309-335.

Ge XJ, Elder GH, Regnerus M, Cox C. Pubertal transitions, perceptions of being overweight, and adolescents' psychological maladjustment: Gender and ethnic differences. *Social Psychology Quarterly.* 2001; 64:363-375.

Gillman MW, Rifas-Shiman SL, Camargo CA, Berkey CS, Frazier AL, Rockett HRH, Field AE, Colditz GA. Risk of overweight among adolescents who were breastfed as infants. *JAMA.* 2001; 285(19): 2461-2467.

Goran MI Metabolic precursors and effects of obesity in children: A decade of progress, 1990-1999. Am J Clin Nutr 2001; 73:158-71.

Henshaw SK. Unintended pregnancy in the United States. *Family Planning Perspectives* 1998; 30(1): 24-29+46.

Hill AJ, Silver EK. Fat, friendless and unhealthy: 9-year old children's perception of body shape stereotypes. *International Journal of Obesity* 1995; 19: 423-30.

Holing EV, Beyer CS, Brown ZA, Connell FA. Why don't women with diabetes plan their pregnancies? *Diabetes Care* 1998; 21:889-895.

Janz NK. Herman WH, Becker MP Carron-Prochownik D, Shayna VL, Lesnick TG, Jacober SJ, Fachnie JD, Kruger DF, Sanfield JA, et al. Diabetes and pregnancy. Factors associated with seeking pre-conception care. *Diabetes Care.* 1995; 18: 157-165.

Jones DC. Social comparison and body image: Attractiveness comparisons to models and peers among adolescent girls and boys. *Sex Roles*. 2001; 45:645-664.

Kaestner R. Health insurance, the quantity and quality of prenatal care, and infant health. *Inquiry – The Journal of Health Care Organization Provision and Financing.* 1999; 36:162-175.

Kehrer BH, Wolin CM. Impact of income maintenance on low birth weight: Evidence from the Gary experiment. *J. Human Resources.* 1979; 14: 434-462.

Khan LK, Bowman BA. Obesity: A major global public health problem. *Annu. Rev. Nutr.* 1999; 19:0

Kieffer EC, Martin JA, Herman WH. Impact of maternal nativity on the prevalence of diabetes during pregnancy among U.S. ethnic groups. *Diabetes Care*. 1999; 22:729-735.

Kimm SYS, Obarzanek E, Barton BA, Aston CE, Similo SL, Morrison JA, Sabry ZI, Schreiber GB, McMahon RP. Race, socioeconomic status, and obesity in 9- to 10 year-old girls: The NHLBI Growth and Health Study. *Annals of Epidemiology.* 1996; 6 (4): 266-275.

Kinsey J. Working wives and the marginal propensity to consume food away from home. *American Journal of Agricultural Economics.* 1983; 65: 10-19.

Kost K, Landry DJ, Darroch JE. Predicting maternal behaviors during pregnancy: Does intention status matter? *Family Planning Perspectives* 1998; 30(2): 79-88.

Kraak V, Pelletier D. How marketers reach young consumers: Implications for nutrition education and health promotion campaigns. *Family Economics and Nutrition Review*. 1998; 11: 31-41

Kumanyika SK. Minisymposium on obesity: Overview and some strategic considerations. *Annu Rev Public Health.* 2001; 22:293-308.

Kumanika SK, Wilson JF, Guilford-Davenport M. Weight-related attitudes and behaviors of black women. *American Journal of the Dietetic Association.* 1993; 93:416-22.

Lissau I, Sorensen TIA. Parental neglect during childhood and increased risk of obesity in young adulthood. *Lancet.* 1994; 343: 324-327.

Lin B-H., Frazao E, Guthrie JF. Contribution of away-from-home foods to American diet quality. *Family Economics and Nutrition Review.* 1999; 12: 85-89.

Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM. Births: Final data for 2000. *National Vital Statistics Reports* 2002; 50(5).

Metcoff J, Costiloe P, Crosby WM, Dutta S, Sandstead HH, Milne D, Bodwell CE, Majors SH. Effect of food supplementation (WIC) during pregnancy on birth weight. *Am J Clin Nut.* 1985; 41:933-9437.

Morland K, Wing S, Diez Roux A, Poole C. Neighborhood characteristics associated with the location of food stores and food service places. Am J Prev Med 2002 Jan;22(1):23-9

Obarzanek E, Schreiber GB, Crawford PB, Goldman SR , Barrier PM, Frederick MM. Energy intake and physical activity in relation to indexes of body fat: The National Heart, Lung, and Blood Institute Growth and Health Study. *American J Clinical Nutrition.* 1994; 60:15-22.

Oropesa RS, Landale NS, Inkley M, Gorman BK. Prenatal care among Puerto Ricans on the United States mainland. *Social Science and Medicine.* 2000; 51:1723-1739.

Packard P, Krogstrand KS. Half of rural girls aged 8 to 17 years report weight concerns and dietary changes, with both more prevalent with increased age. *Journal of the American Dietetic Association.* 2002; 102: 672-677.

Pain R, Bailey C, Mowl G. Infant feeding in North East England: Contested spaces of reproduction. *Area.* 2001; 33(3):261-272.

Popkin BM. An overview on the nutrition transition and its health implications: the Bellagio meeting. *Public Health Nutrition.* 2002; 5:93-103.

Putnam JJ, Allshouse JE. *Food Consumption, Prices and Expenditures*. [928]. Washington, DC, United States Department of Agriculture. Statistical Bulletin. ERS. 1996.

Repetti RL, Taylor SE, Seeman TE. Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin* 2002; 128:330-366.

Ringel JS, Evans WN. Cigarette taxes and smoking during pregnancy. *AJPH*. 2001; 91:1851-1856.

Sable MR, Wilkinson DS. Impact of perceived stress, major life events and pregnancy attitudes on low birth weight. *Family Planning Perspectives*. 2000; 32:288-294.

Sorbara M, Geliebter A. Body image disturbance in obese outpatients before and after weight loss in relation to race, gender, binge eating, and age at onset of obesity. *International Journal of Eating Disorders.* 2002; 31: 416-423.

Stettler N. Environmental factors in the etiology of obesity in adolescents. *Ethnicity and Disease.* 2002; 12: S1-41-S1-44.

Strauss RS. Childhood obesity and self-esteem. *Pediatrics*. 2000; 105: e15)

Troiano RP, Flegal KM Overweight children and adolescents: Description, epidemiology, and demographics. *Pediatrics* 1998;101:497-504.

USDHHS. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity.* 2001. URL http://www.surgeongeneral.gov/topics/obesity/calltoaction/

USDHHS. *Health United States, 1998*. (PHS) 98-1232. Hyattsville, MD: National Center for Health Statistics, 1998.

Variyam JN. Overweight children: Is parental nutrition knowledge a factor? *Food Review*. 2001; 24(2): 18-22.

WangG, Dietz W. Economic burden of obesity in youths aged 6 to 17 years: 1979-1999. *Pediatrics* 2002; 109: e81.

Wolf A. Colditz G. Current estimates of the economic cost of obesity in the United States." *Obesity Research* 1998; 6: 97-106.

Wolfe WS, Campbell CC, Frongillo EA, Haas JD, Melnik TA. Overweight schoolchildren in New York State - Prevalence and characteristics. *Am J Public Health* 1994; 84(5): 807-813.

Yilmaz G, Gurakan B, Akgun S, Ozbek N. Factors influencing breastfeeding for working mothers. *Turkish J. Pediatr.* 2002; 44(1):30-34.

Zambrana RE, Scrimshaw SC, Collins N, Dunkel-Schetter C. Prenatal health behaviors and psychosocial risk factors in pregnant women of Mexican origin: the role of acculturation. *AJPH*. 1997; 87: 1022-1026.